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OPP OFFICIAL RECORD
HEALTH EFFECTS DIVISION
SCIENTIFIC DATA REVIEWS
EPA SERIES 361

January 6, 1999

Memorandum

SUBJECT: Review of the Pilot Study Results for the Broadleaf Turf Herbicide Transferable Foliar Residue (TFR) Task Force; MRID No. 446557-01; *Comparison of the Transferable Turf residues from the Application of Various Forms of Phenoxy Herbicides and the Effects from the Application of Various Spray Volumes Per Acre*, dated 9/10/98; DP Barcode 252025; Guideline: 875 2100 Transferable Residue Dissipation: Lawn and Turf.

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The Broadleaf Turf Herbicide Transferable Foliar Residue (TFR) Task Force is responding to the turf data call-in for 2,4-D; 2,4-D DMA; 2,4-D 2EHE; MCPA; MCPA DMA; MCPA 2EHE; 2,4-DP-p DMA; 2,4-DP-p 2EHE; MCPP; MCPP DMA; MCPP-p; MCPP-p DMA; Dicamba; and Dicamba DMA. The following table lists the PC Codes for these chemicals.

Chemical	Case Number	PC Code		
		Acid	DMA	2-EHE
2,4-D	75	030001	030019	030003
2,4-DP-p	294	031402	031403	031465
MCPA	17	030501	030516	--
MCPP-p	377	129046	031520	031564
Dicamba	65	029801	029802	--

Dicamba						
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The Task Force has conducted the **pilot study** and is requesting a review from the Agency before starting the **definitive study**. The results of the pilot study are reviewed in this memo for the purpose of determining if the Turf Task Force should proceed with the definitive study as planned. The Turf Task Force needs the Agency's opinion by early January 1999 for logistical reasons.

Pilot Study Summary

2,4-D, 2,4-DP, MCPA, MCPP, and Dicamba represent approximately 75% EPA registered products. The Turf Task Force conducted a pilot study in North Carolina during April-May 1998, to select a surrogate compound to be used in a more extensive study (i.e., the definitive study). The pilot study monitored transferable foliar residue (TFR) of DMA salt and 2EHE along with monitoring TFR resulting from single ingredient and combination compounds in side by side tests in a single location. The Task Force anticipated that the 2EHE forms will result in less transferable residues than DMA forms. If the hypothesis is confirmed, and they can prove that DMA salts are the most transferable of all the others and its combinations, they are poised to use DMA salts as a surrogate product that produces the "worst case" scenario.

Data have been submitted in the pilot study for "...the comparison of 2,4-D, MCPA and 2,4-*p*-DP applied alone as the 2-ethylhexyl ester forms and dimethylamine salt forms, and in combinations as the dimethylamine salt forms. MCPP-*p* as the dimethylamine salt form was applied alone and in combination. Also, the dimethylamine salt of Dicamba was applied in combination with the dimethylamine forms of 2,4-D and MCP*p*-p. These applications were made in a nominal spray solution of 10 gallons per acre using a tractor boom sprayer."

The pilot study was conducted in two phases. The first phase compared the various compounds using a spray volume of 10 gallons per acre (GPA). The second phase investigated the effects of various dilution rates and was performed using 2, 5, and 20 GPA for comparison.

Results

For this review, only the Excel spreadsheets for the first phase were obtained. The data for the second phase are available in the registrant's hard copy submission.

PHASE I:

Table 1 lists the transferable residues as a percentage of the application rate (maximum label rate -- calculated rate not the analytical rate) converted to acid equivalents (ae) for 3 hrs, 8 hrs, 24 hrs, and 2, 3, 4, 5, 6, 7, 10 and 14 days after treatment (DAT). HED performed a linear regression for each of the 12 sets of data (triplicate samples) listed in Table 1. Table 2 summarizes the treatment number, compound, application rate (lb ae/acre), correlation of

determination (R^2), initial residue value as a percent of the application rate, the percent dissipation per day, and the half-life. One-half the LOQ (LOQ = 0.88 ng/cm²) was used for the first sampling interval that the residue values were nondetected (either less than the LOQ or LOD -- see Conclusion section for further discussion). The 12 sets of regressions are provided in Appendix A. The initial residue levels (as a percentage of the application rate) ranged from 0.186 to 2.05 percent for 0 DAT and ranged from 0.054 to 0.880 percent for 1 DAT. The dissipation over time ranged from 33 to 93 percent per day. The half-life ranged from 0.26 to 1.44 days. When all the compounds are grouped as one "sample" and the samples were assumed to be zero after the first interval of nondetects, the initial residue level (as a percentage of the application rate) is 0.391 on 0 DAT, dissipation rate is 42 percent per day, and the half-life is 1.27 days. Assuming one-half the LOQ for all intervals that were nondetect, the initial residue level (as a percentage of the application rate) is 0.223 on 0 DAT, dissipation rate is 33 percent per day, and the half-life is 1.71 days. Figure 1 illustrates the comparison of the 12 dissipation curves along with the two "overall" curves. Other pertinent items noted in this cursory review include the following:

- Each plot consisted of full grass (fescue) coverage with no bare spots (turf farm);
- The grass was mowed to a height of 2 inches the day prior to the application and was not mowed again until after the seventh day of sampling;
- No irrigation was performed and 0.05 inches of rain fell after 2 DAT, 0.01 inches just before 3 DAT, 0.04 inches before 7 DAT, 0.17 inches before 10 DAT, and 0.76 inches between 10 and 14 DAT;
- Mean laboratory recoveries ranged from 88.8 to 108 percent;
- Sampling was conducted using a modified California roller (100 percent, 200 thread count cotton cloth) as per the SOP developed by the Outdoor Residential Exposure Task Force (ORETF).
- Study site was in North Carolina, the temperature ranged from 35 to 81 ° F.

PHASE 2:

A cursory review of the second phase indicates that the gallons per acre did not affect the residue transfer (i.e., still within the range of the results in Phase 1). 2,4-D DMA, MCPP-p DMA, and Dicamba DMA, were applied at approximately 1.8, 0.7, and 0.2 lb ae/acre. At 2 GPA, the highest values within the triplicate samples, as a percentage of the application rate, are 1.35, 1.66, and 1.52 percent for 2,4-D DMA, MCPP-p DMA, and Dicamba DMA, respectively. At 5 GPA, the highest values within the triplicate samples, as a percentage of the application rate, are 1.23, 1.29, and 1.31 percent for 2,4-D DMA, MCPP-p DMA, and Dicamba DMA, respectively. At 20 GPA, the highest values within the triplicate samples, as a percentage of the

application rate, are 0.714, 0.724, and 0.770 percent for 2,4-i-DMA, MCPP-p DMA, and Dicamba DMA, respectively.

Conclusions

It was hypothesized in the protocol that the DMA salt (or any salt or acid form which would rapidly convert to ionic form) to be less readily absorbed by the waxy cuticle of the plant and thus more readily available to be dislodged. The results of the ranking of the data in the pilot study indicate that MCPP-p DMA has the highest initial residue level (as a percentage of the application rate) as well as the highest percent dissipation per day. However, the highest residue levels (as a percentage of the application rate) on 1 DAT are for 2,4-D 2-EHE and MCPA 2-EHE. Other considerations that are noteworthy include the following:

- It would be appropriate to use one-half the LOD for residues that were not detected instead of the LOQ, however, in the limited time of this review, the LOD was not evident in the summary of the submission. Although the effect of using the LOQ instead of the LOD is not believed to be significant in this analysis, it is the most conservative manner to handle the samples.
- No discussion was provided on how the Task Force plans to relate the transferable foliar residue data from the definitive study to human exposure (e.g., activity-specific transfer coefficients). In the absence of transfer coefficients, the Agency would use the default provided in the SOPs for Residential Exposure Assessments (e.g., hand-to-mouth activities and dermal contact with turf or "Jazzercise" transfer coefficients)
- A complete review of this data submission is necessary to ensure that the requirements of Series 875 have been met (e.g., QA/QC samples, sample storage, etc.).
- Only one study location was performed because this study was designed as the pilot.

Recommendations

HED requests additional information from the registrant on what effect environmental conditions (e.g., climatic and soil types) would have on the transferability and/or dissipation of 2,4-D turf residues. If a rationale can be established by the registrant (e.g., data from magnitude of residue trials) for the use of NC as a representative site of 2,4-D residues for geographic variations, then HED recommends the following three items:

- (1) The results for treatment number 9 for MCPP-p DMA, which showed an initial concentration of residues at 0 DAT of ***2.05 percent of the application rate*** (lb ae/acre), be used to represent all 2,4-D residential turf products. The highest initial concentration rate

has been selected because of the concern for children entering treated lawns on the day of application.

- (2) Treatment number 2 for 2,4-D 2-EHE, which showed the highest combination of initial residue levels (1.46 percent of the application rate based on lb ae/acre) and the longest *half-life of 1.37 days*, be used to represent all 2,4-D sodfarm or other uses that require assessments over time. This combination was selected because it represents the highest residue levels for an intermediate-term exposure duration.
- (3) Recommendations (1) and (2) above will be used by the HED for all formulations.

At this time, HED recommends that the definitive study be put on hold until a formal HED review of the pilot study can be completed. If HED finds (a) that the requirements of Series 875 (e.g., QA/QC) are met, (b) that an acceptable rationale is established for the selection of one geographical region to be representative, and (c) that the registrant agrees to the three recommendations above, then an additional study may not be required.

cc: D. Miller
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% ae combined

Table 1. Transferable Tert Residues for 2,4-D Reported as a Percentage of the Application Rate													
Treatment	compound	rate (lb/ae)	mg sq/cm	0 day	1 day	2 day	3 day	4 day	5 day	6 day	7 day	10 day	14 day
2	24D ehe	1.705	19111	1.295783	1.516324	2.23420	~6.841	0.333188	0.294735	0.1428	0.051238	0.077901	0.009195 0.002302
			1154031	1.248826	1.688424	~5/1604	0.222852	0.185554	0.136687	0.069364	0.065184	0.003123 0.002302	
			1122804	1.19854	1.377443	0.391206	0.145311	0.136707	0.067871	0.025438	0.03185	0.002302 0.002302	
3	24D dma	1.725	19335	2.291182	1.53604	4.360683	0.07548	0.135234	0.044375	0.026429	0.024515	0.010189 0.002276	
			1.57745	0.532713	2.477173	0.076028	0.025566	0.040548	0.022084	0.015516	0.002276 0.002276		
			0.915438	0.346522	2.146367	0.042307	0.02532	0.039979	0.007344	0.014999	0.002276 0.002276		
9	24D dma com	1.585	17765	0.655598	3566	0.466185	0.011059	0.008725	0.006699	0.002477			
			0.602308	1.165212	0.445258	0.00910	0.006305	0.006136	0.002477				
			0.499296	0.878131	0.415424	0.009594	0.002477	0.005446	0.002477				
4	MCPCA ehe	1.544	17306	2.004342	1.294409	2.025712	0.427242	0.175266	0.076403	0.022516	0.013771	0.001631 0.002542	
			1.819814	1.21547	84.914	0.26749	0.08498	0.067734	0.019366	0.008101	0.007619 0.002542	0.002542	
			1.46312	0.954668	64.3654	0.8041	0.02119	0.03387	0.06587	0.006767	0.006396 0.002542	0.002542	
5	MCPCA dma	1.547	17340	1.793656	1.38985	2.760092	0.054671	0.032353	0.042272	0.037832	0.019204	0.023183	0.005288 0.002537
			1.7943	1.366782	2.06459	0.047751	0.019954	0.027797	0.05398	0.012745	0.002537 0.002537	0.002537	
			0.774547	0.911186	1.89158	0.041061	0.010265	0.007497	0.008304	0.007151	0.002537 0.002537	0.002537	
10	MCPCA dma com	1.496	11724	1.74857	2.170802	1.54761	0.01140	0.011285	0.011446	0.00619	0.007872	0.002624	
			0.922996	1.109256	0.546675	0.025167	0.011033	0.011392	0.002624	0.002624	0.002624	0.002624	
			0.614265	0.745468	0.180105	0.01801	0.009125	0.007543	0.002624	0.002624	0.002624	0.002624	
6	24DP ehe	0.612	6860	0.371657	0.115922	0.136367	0.010756	0.006414					
			0.175293	0.095161	0.092908	0.006414	0.006414						
			0.112235	0.064682	0.05833	0.006414	0.006414						
7	24DP dma	0.596	6580	1.208084	1.946108	2.110778	0.037425	0.023653	0.026048	0.006587			
							0.06587	0.800898	0.647305	0.006587	0.013473	0.006587	0.006587
10	24DP dma com	0.587		365768	2.94876	~0.0275	0.02656	0.005588	0.015808	0.006688			
				10.491	1.53588	~0.1712	0.024168	0.006688	0.006688	0.006688			
				0.1744	~0.0275	0.199118	0.02656	0.006688	0.006688	0.006688			
8	MCPP dma	0.599	-14	3d-23	~0.0285	0.722371	0.031278	0.006553					
				4-1-2	0.618111	0.021001	0.006553						
				0.612154	1.136431	0.490021	0.016831	0.006551					
MCPD	MCPD	0.593	-14	4-5-4	~0.0285	0.722371	0.031278	0.006553					
				4-4-0	~0.0285	0.722371	0.031278	0.006609					
				2.25(LA)	~0.0285	0.722371	0.031278	0.006609					
MCPD	MCPD	0.591	-14	18697	0.529537	0.56498	0.020751	0.006665					
				1.3360	1.343532	0.552863	0.018176	0.006665					
				1.4535	0.898213	0.172675	0.114477	0.006665					

Nondetect values are nondetects (either less than the LOQ or LOD) and are reported as one-half the LOQ of 0.88 ng/cm² converted to a percentage of the application rate

Table 2. Turf Transferable Residues as a Percentage of the Application Rate: Summary of Phase 1 of the Pilot Study for 2,4-D.

Treatment No. ^a	Compound	Application Rate (lb ae/acre) ^b	R ²	Initial % of application Rate ^c		Percent Dissipation Per Day	Half Life (Days)
				0 DAT	1 DAT		
2	2,4-D 2-EHE	1.705	0.94	1.46	0.880	40	1.37
3	2,4-D DMA	1.725	0.81	0.845	0.423	50	1.00
4	MCPA 2-EHE	1.544	0.84	0.845	0.491	42	1.28
5	MCPA DMA	1.547	0.68	0.403	0.249	38	1.44
6	2,4-DP-p 2-EHE	0.612	0.85	0.186	0.054	71	0.56
7	2,4-DP-p DMA	0.596	0.79	1.20	0.376	69	0.60
8	MCPP-p DMA	0.599	0.93	1.91	0.277	86	0.36
9	2,4-D DMA	1.585	0.84	0.730	0.200	73	0.53
9	MCPP-p DMA	0.594	0.87	2.05	0.149	93	0.26
10	MCPA DMA	1.496	0.84	0.577	0.233	60	0.76
10	2,4-DP-p DMA	0.587	0.83	1.03	0.302	71	0.57
10	MCPP-p DMA	0.589	0.93	1.90	0.259	86	0.35
Overall	Stop at one ND	1.1 ± 0.53	0.57	0.391	0.227	42	1.27
Overall	Extend ND to 14 DAT	1.1 ± 0.53	0.54	0.223	0.149	33	1.71

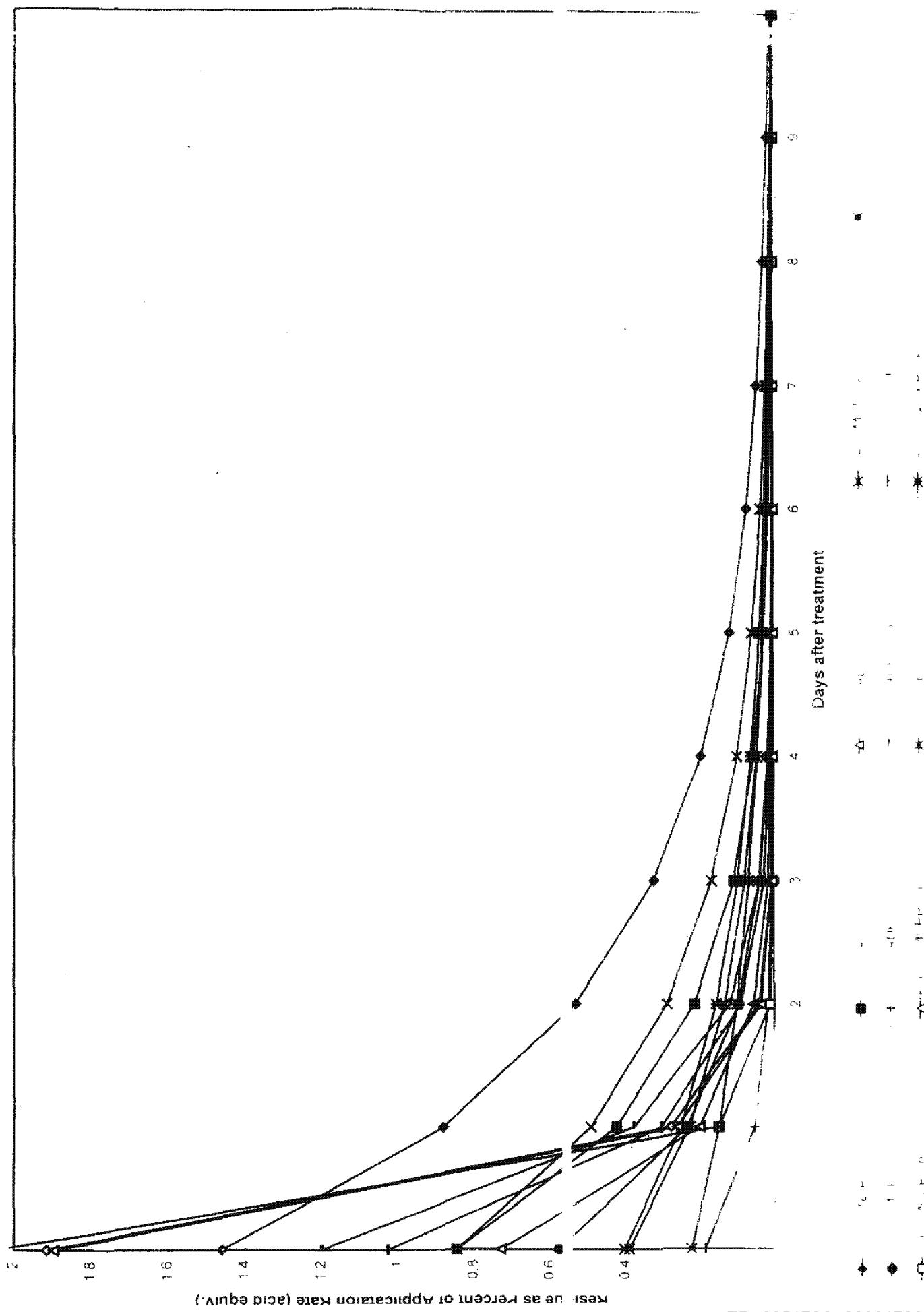
a Treatment number represents each plot as identified in the study report. Treatment 1 was the control. Treatment 9 was a combination of 2,4-D+MCPP-p+Dicamba DMA. Treatment 10 was a combination of MCPA+MCPP-p+2,4-DP-p DMA.

b All compounds converted to acid equivalents (ae).

c All residues converted as a percentage of the application rate (ae). The values are predicted values. Sampling intervals were 3 hr, 8 hr, and 1, 2, 3, 4, 5, 6, 7, 10, and 14 days after treatment (DAT). See Appendix A for individual regressions.

d "Overall" represents all treatment plots as one sample. "Stop at one ND" represents using one sampling interval at $\frac{1}{2}$ LOQ. "Extend ND to 14 DAT" represents using $\frac{1}{2}$ LOQ for all sampling intervals regardless of when sample was ND.

Comparison of Predicted Dissipation for All Sites



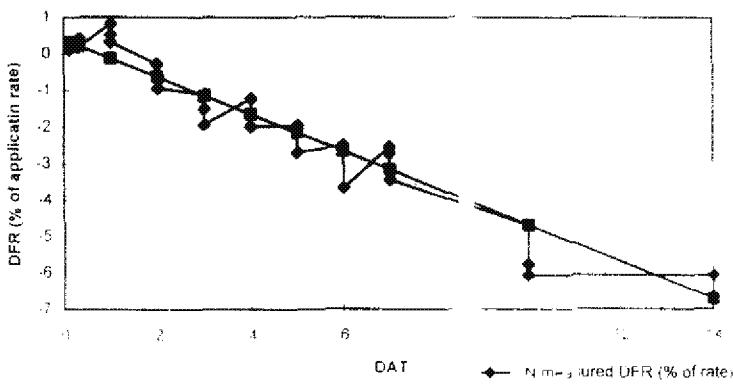
Appendix A

2,4-D Regression Analysis

Natural Log of Raw Data

DAT	LN		Application rate (lb acid equiv/A)	μ	σ
	measured DFR (% of rate)	predicted DFR (% of rate)			
0.125	0.2591153	0.314407	slope	-0.5059	
0.125	0.1432606	0.314407	intercept	0.37764	
0.125	0.1158288	0.314407	R^2	0.9389	
0.333	0.4162888	0.209179	Adjusted R^2	0.93692	
0.333	0.2222041	0.209179	dissipation	40%	
0.333	0.1811045	0.209179	Half-life	1.37 days	
1	0.821288	-0.128258			
1	0.5237953	-0.128258			
1	0.3202291	-0.128258			
2	-0.2733315	-0.63416			
2	-0.5592042	-0.63416			
2	-0.9385222	-0.63416			
3	-1.0990479	-1.140062			
3	-1.5012457	-1.140062			
3	-1.9288801	-1.140062			
4	-1.2216794	-1.645964			
4	-1.6844075	-1.645964			
4	-1.989913	-1.645964			
5	-1.9463109	-2.151866			
5	-1.9900648	-2.151866			
5	-2.6901393	-2.151866			
6	-2.510371	-2.657769			
6	-2.6683873	-2.657769			
6	-3.6714973	-2.657769			
7	-2.552314	-3.163671			
7	-2.7305372	-3.163671			
7	-3.4467336	-3.163671			
10	-4.6891401	-4.681377			
10	-5.7690603	-4.681377			
10	-6.073977	-4.681377			
14	-6.073977	-6.704986			
14	-6.073977	-6.704986			
14	-6.073977	-6.704986			

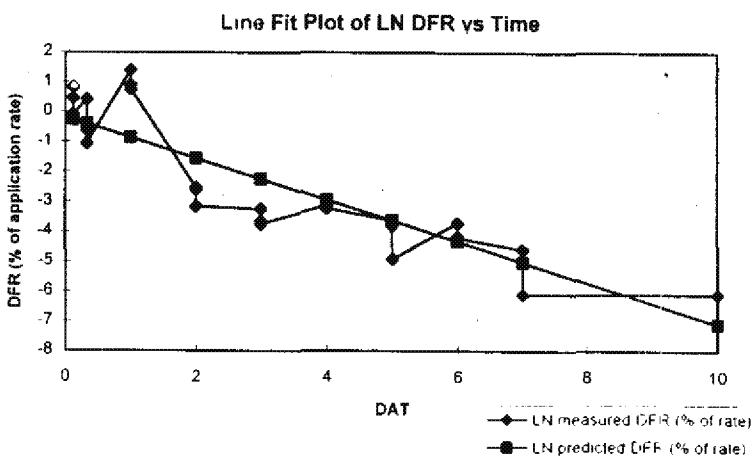
Line Fit Plot of LN DFR vs Time



(3) - 24D dma

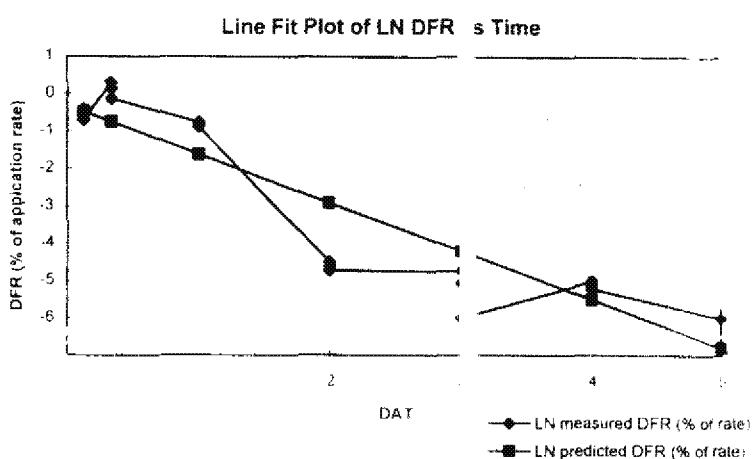
Natural Log of Raw Data

DAT	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv./A)	incremental DFR (% of rate)
0.125	0.8290678	-0.254594	slope -0.69205	0 0.84527986
0.125	0.4558098	-0.254594	intercept -0.16809	1 0.42310316
0.125	-0.0883523	-0.254594	R ² 0.80837	2 0.21178345
0.333	0.4292301	-0.398541	Adjusted R ² 0.80153	3 0.10600779
0.333	-0.629773	-0.398541	dissipation 50%	4 0.05306199
0.333	-1.0598094	-0.398541	Half-life 1.00 days	5 0.02656007
1	1.4062643	-0.860139		6 0.01329459
1	0.9071986	-0.860139		7 0.00665458
1	0.7637765	-0.860139		8 0.00333094
2	-2.5301345	-1.552191		9 0.00166729
2	-2.5766545	-1.552191		10 0.00083456
2	-3.1628099	-1.552191		11 0.00041774
3	-3.2389888	-2.244243		12 0.0002091
3	-3.6550641	-2.244243		13 0.00010466
3	-3.7493748	-2.244243		14 5.2389E-05
4	-3.1150681	-2.936294		15 2.6223E-05
4	-3.2052632	-2.936294		16 1.3126E-05
4	-3.2193932	-2.936294		17 6.5702E-06
5	-3.6333026	-3.628346		18 3.2887E-06
5	-3.8128882	-3.628346		19 1.6462E-06
5	-4.9138451	-3.628346		20 8.2398E-07
6	-3.7084649	-4.320398		21 4.1244E-07
6	-4.1658897	-4.320398		22 2.0645E-07
6	-4.1997913	-4.320398		23 1.0334E-07
7	-4.5864685	-5.01245		24 5.1725E-08
7	-6.0854826	-5.01245		25 2.5891E-08
7	-6.0854826	-5.01245		26 1.296E-08
10	-6.0854826	-7.088605		27 6.4869E-09
10	-6.0854826	-7.088605		28 3.247E-09
10	-6.0854826	-7.088605		29 1.6253E-09



Natural Log of Raw Data

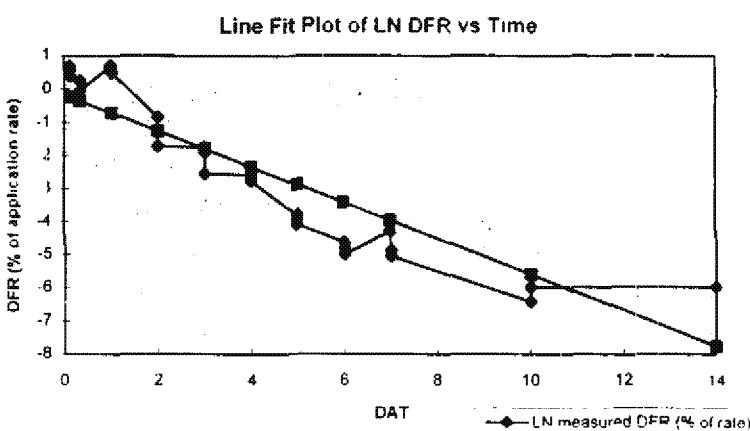
DAT	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv./ A)
0.125	-0.4176414	-0.476677	slope -1.29584
0.125	-0.5069865	-0.476677	intercept -0.3147
0.125	-0.6945554	-0.476677	R ² 0.84329
0.333	0.3049816	-0.746211	Adjusted R ² 0.83504
0.333	0.1529035	-0.746211	dissipation
0.333	-0.1299593	-0.746211	Half-life 5.1 days
1	-0.7633873	-1.610536	
1	-0.8091024	-1.610536	
1	-0.8784566	-1.610536	
2	-4.5017818	-2.906375	
2	-4.6145015	-2.906375	
2	-4.7223905	-2.906375	
3	-4.7415604	-4.202215	
3	-5.0664866	-4.202215	
3	-6.0007959	-4.202215	
4	-5.005862	-5.498054	
4	-5.0936376	-5.498054	
4	-5.2102745	-5.498054	
5	-6.0007959	-6.793893	
5	-6.0007959	-6.793893	
5	-6.0007959	-6.793893	



(4) - MCPA ehe

Natural Log of Raw Data

DAT	LN		Application rate (lb acid equiv./ A)	1.544	incremental predicted DFR (% of rate)
	measured DFR (% of rate)	predicted DFR (% of rate)			
0.125	0.6953156	-0.236676	slope	-0.5424	0 0.84461347
0.125	0.5987343	-0.236676	intercept	-0.16888	1 0.49101769
0.125	0.3941482	-0.236676	R ²	0.8398	2 0.28545409
0.333	0.2580546	-0.349495	Adjusted R ²	0.83463	3 0.16594929
0.333	0.2402343	-0.349495	dissipation	42%	4 0.09647494
0.333	-0.0463912	-0.349495	Half-life	1.28 days	5 0.0560859
1	0.7059216	-0.711275			6 0.03260565
1	0.6140572	-0.711275			7 0.01895536
1	0.4969249	-0.711275			8 0.01101973
2	-0.8504058	-1.253674			9 0.00640634
2	-1.3190509	-1.253674			10 0.00372434
2	-1.712482	-1.253674			11 0.00216515
3	-1.7414517	-1.796073			12 0.00125872
3	-1.9065081	-1.796073			13 0.00073176
3	-2.5492617	-1.796073			14 0.00042541
4	-2.5717314	-2.338472			15 0.00024731
4	-2.6921628	-2.338472			16 0.00014378
4	-2.7585013	-2.338472			17 8.3584E-05
5	-3.7935136	-2.880871			18 4.8592E-05
5	-3.9442116	-2.880871			19 2.8249E-05
5	-4.099125	-2.880871			20 1.6423E-05
6	-4.6323785	-3.42327			21 9.5473E-06
6	-4.8157599	-3.42327			22 5.5503E-06
6	-4.9956972	-3.42327			23 3.2267E-06
7	-4.2852028	-3.965669			24 1.8758E-06
7	-4.8770683	-3.965669			25 1.0905E-06
7	-5.0520155	-3.965669			26 6.3398E-07
10	-6.4188559	-5.592866			27 3.6857E-07
10	-5.9748041	-5.592866			28 2.1427E-07
10	-5.9748041	-5.592866			29 1.2456E-07
14	-5.9748041	-7.762461			30 7.2416E-08
14	-5.9748041	-7.762461			31 4.2099E-08
14	-5.9748041	-7.762461			32 2.4474E-08



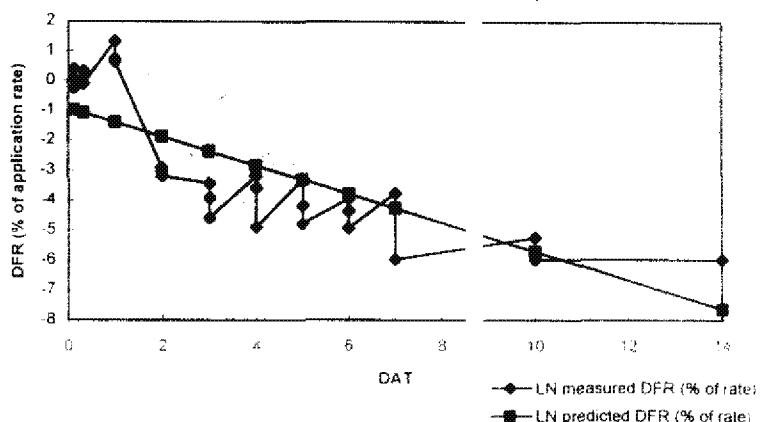
55	9.35E-14
54	1.6083E-13
53	2.7665E-13
52	4.7588E-13
51	8.1857E-13
50	1.408E-12
49	2.422E-12
48	4.1662E-12
47	7.1663E-12
46	1.2327E-11
45	2.1204E-11
44	3.6474E-11
43	6.2739E-11
42	1.0792E-10
41	1.8564E-10
40	3.1932E-10
39	5.4927E-10
38	9.4481E-10
37	1.6252E-09
36	2.7955E-09
35	4.8087E-09
34	8.2716E-09
33	1.4228E-08
32	2.4474E-08
31	4.2099E-08
30	7.2416E-08
29	1.2456E-07
28	2.1427E-07
27	3.6857E-07
26	6.3398E-07
25	1.0905E-06
24	1.8758E-06
23	3.2267E-06
22	5.5503E-06
21	9.5473E-06
20	1.6423E-05
19	2.8249E-05
18	4.8592E-05
17	8.3584E-05
16	0.00014378
15	0.00024731
14	0.00042541
13	0.00073176
12	0.00125872
11	0.00216515
10	0.00372434
9	0.00640634
8	0.01101973
7	0.01895536
6	0.03260565
5	0.0560859
4	0.09647494
3	0.16594929
2	0.28545409
1	0.49101769
0	0.84461347

S1 - MCPA dma

Natural Log of Raw Data

DAT	LN		Application rate (lb acid equiv / A)	Dr
	measured DFR (% of rate)	predicted DFR (% of rate)		
0.125	0.401227	-0.969056	slope	-0.48028
0.125	0.0755076	-0.969056	intercept	-0.90902
0.125	-0.2503263	-0.969056	R ²	0.67755
0.333	0.3291959	-1.068954	Adjusted R ²	0.66714
0.333	0.3124591	-1.068954	dissipation	38%
0.333	-0.093006	-1.068954	Half-life	1.44 days
1	1.3244435	-1.389297		
1	0.7249319	-1.389297		
1	0.6374125	-1.389297		
2	-2.9064167	-1.869572		
2	-3.0417581	-1.869572		
2	-3.1926933	-1.869572		
3	-3.4310503	-2.349847		
3	-3.9143325	-2.349847		
3	-4.5789877	-2.349847		
4	-3.1636255	-2.830122		
4	-3.5828271	-2.830122		
4	-4.8932368	-2.830122		
5	-3.2746105	-3.310398		
5	-4.1735226	-3.310398		
5	-4.790958	-3.310398		
6	-3.9526288	-3.790673		
6	-4.3626085	-3.790673		
6	-4.9404897	-3.790673		
7	-3.7643192	-4.270948		
7	-5.9765816	-4.270948		
7	-5.9765816	-4.270948		
10	-5.2422489	-5.711773		
10	-5.9765816	-5.711773		
10	-5.9765816	-5.711773		
14	-5.9765816	-7.632874		
14	-5.9765816	-7.632874		
14	-5.9765816	-7.632874		

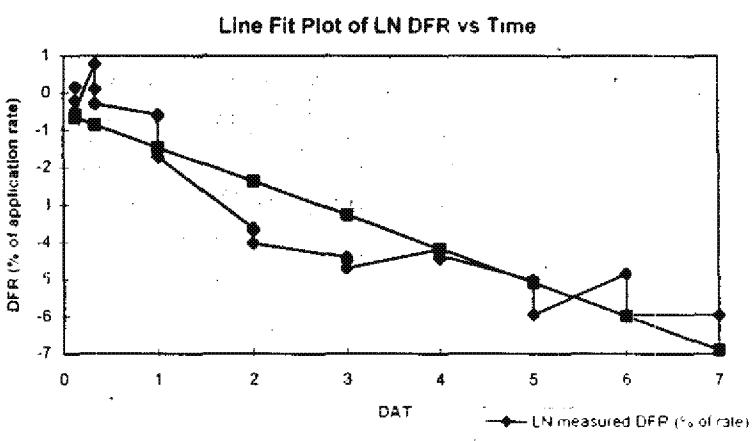
Line Fit Plot of LN DFR vs Time



(10) - MCPA dma.com

Natural Log of Raw Data

DAT	LN		Application rate (lb acid equiv./ A)	incremental predicted DFR (% of rate)
	measured DFR (% of rate)	predicted DFR (% of rate)		
0.125	0.1611463	-0.663031	slope -0.90611	0 0.57708459
0.125	-0.1948037	-0.663031	intercept -0.54977	1 0.23319477
0.125	-0.4873284	-0.663031	R ² 0.8434	2 0.09423194
0.333	0.7750965	-0.851503	Adjusted R ² 0.83714	3 0.03807829
0.333	0.1036893	-0.851503	dissipation 60%	4 0.0153871
0.333	-0.2937437	-0.851503	Half-life 0.76 days	5 0.00621779
1	-0.5713434	-1.455881		6 0.00251255
1	-0.603535	-1.455881		7 0.0010153
1	-1.7142155	-1.455881		8 0.00041027
2	-3.631403	-2.361996		9 0.00016579
2	-3.6822223	-2.361996		10 6.6994E-05
2	-4.0168006	-2.361996		11 2.7071E-05
3	-4.3993514	-3.268111		12 1.0939E-05
3	-4.5068718	-3.268111		13 4.4205E-06
3	-4.6967897	-3.268111		14 1.7863E-06
4	-4.1898933	-4.174226		15 7.2182E-07
4	-4.4289102	-4.174226		16 2.9168E-07
4	-4.3706413	-4.174226		17 1.1787E-07
5	-5.0087287	-5.080341		18 4.7829E-08
5	-5.943038	-5.080341		19 1.9246E-08
5	-5.943038	-5.080341		20 7.7772E-09
6	-4.8444257	-5.986455		21 3.1427E-09
6	-5.943038	-5.986455		22 1.2699E-09
6	-5.943038	-5.986455		23 5.1317E-10
7	-5.943038	-6.89257		24 2.0737E-10
7	-5.943038	-6.89257		25 8.3796E-11
7	-5.943038	-6.89257		26 3.3861E-11

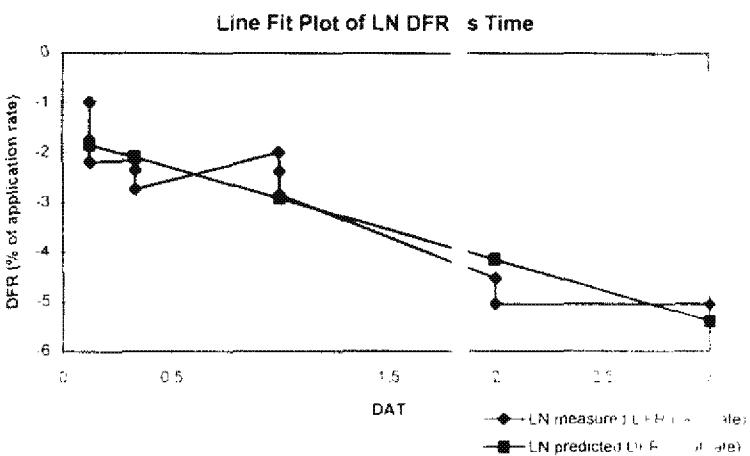


DAT	0	0.57708459
1	0.23319477	
2	0.09423194	
3	0.03807829	
4	0.0153871	
5	0.00621779	
6	0.00251255	
7	0.0010153	
8	0.00041027	
9	0.00016579	
10	6.6994E-05	
11	2.7071E-05	
12	1.0939E-05	
13	4.4205E-06	
14	1.7863E-06	
15	7.2182E-07	
16	2.9168E-07	
17	1.1787E-07	
18	4.7829E-08	
19	1.9246E-08	
20	7.7772E-09	
21	3.1427E-09	
22	1.2699E-09	
23	5.1317E-10	
24	2.0737E-10	
25	8.3796E-11	
26	3.3861E-11	
27	1.3583E-11	
28	5.5292E-12	
29	2.2343E-12	
30	9.0286E-13	
31	3.6484E-13	
32	1.4743E-13	
33	5.9574E-14	
34	2.4073E-14	
35	9.7278E-15	
36	3.9309E-15	
37	1.5885E-15	
38	6.4188E-16	
39	2.5938E-16	
40	1.0481E-16	
41	4.2354E-17	
42	1.7115E-17	
43	6.9159E-18	
44	2.7947E-18	
45	1.1293E-18	
46	4.5534E-19	
47	1.844E-19	
48	7.4516E-20	
49	3.0111E-20	
50	1.2168E-20	
51	4.9168E-21	
52	1.9368E-21	
53	8.0287E-22	
54	3.2443E-22	
55	1.311E-22	

4DPR-ene

Natural Log of Raw Data

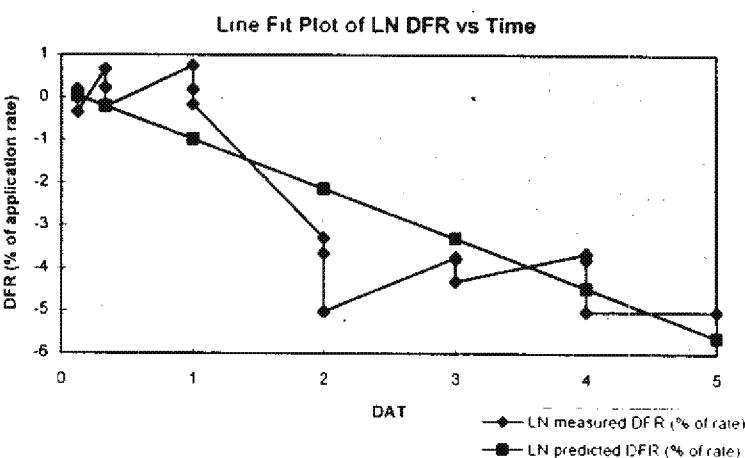
DAT	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv./A)
0.125	-0.9897847	-1.83456	0.612
0.125	-1.7412976	-1.83456	slope -1.23631
0.125	-2.1871587	-1.83456	intercept 1.58002
0.333	-2.1548396	-2.091713	R 0.95262
0.333	-2.3521867	-2.091713	Adjusted R 0.94128
0.333	-2.738272	-2.091713	dissipation 71%
			Half-life 0.56 days
1	-1.9924225	-2.916332	
1	-2.3761465	-2.916332	
1	-2.8418276	-2.916332	
2	-4.5322926	-4.152642	
2	-5.0492731	-4.152642	
2	-5.0492731	-4.152642	
3	-5.0492731	-5.388952	
3	-5.0492731	-5.388952	
3	-5.0492731	-5.388952	



(7) - 24DP dma.

Natural Log of Raw Data

DAT	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv./A)	0.596
0.125	0.1890355	0.036772	slope	-1.16145
0.125	-0.0014981	0.036772	intercept	0.18195
0.125	-0.3473092	0.036772	R ²	0.79449
0.333	0.6658314	-0.20481	Adjusted R ²	0.78367
0.333	0.2231436	-0.20481	dissipation	69%
0.333	-0.2220214	-0.20481	Half life	0.60 days
1	0.7470568	-0.979497		
1	0.1964429	-0.979497		
1	-0.1656941	-0.979497		
2	-3.2854123	-2.140946		
2	-3.647818	-2.140946		
2	-5.0226836	-2.140946		
3	-3.7442782	-3.302396		
3	-3.7829927	-3.302396		
3	-4.3070636	-3.302396		
4	-3.647818	-4.463845		
4	-3.796238	-4.463845		
4	-5.0226836	-4.463845		
5	-5.0226836	-5.625295		
5	-5.0226836	-5.625295		

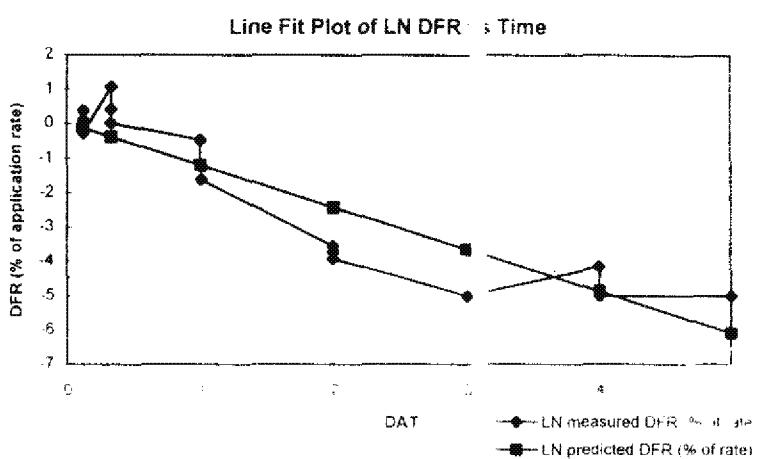


DAT	incremental predicted DFR (% of rate)
0	1.19955769
1	0.37550005
2	0.11754356
3	0.03679491
4	0.01151799
5	0.0036055
6	0.00112864
7	0.0003533
8	0.00011059
9	3.462E-05
10	1.0837E-05
11	3.3923E-06
12	1.0619E-06
13	3.3241E-07
14	1.0406E-07
15	3.2573E-08
16	1.0196E-08
17	3.1918E-09
18	9.9913E-10
19	3.1276E-10
20	9.7904E-11
21	3.0647E-11
22	9.5935E-12
23	3.0031E-12
24	9.4006E-13
25	2.9427E-13
26	9.2115E-14
27	2.8835E-14
28	9.0263E-15
29	2.8255E-15
30	8.8448E-16
31	2.7587E-16
32	8.6669E-17
33	2.713E-17
34	8.4926E-18
35	2.6585E-18
36	8.3219E-19
37	2.605E-19
38	8.1545E-20
39	2.5526E-20
40	7.9905E-21
41	2.5013E-21
42	7.8298E-22
43	2.451E-22
44	7.6724E-23
45	2.4017E-23
46	7.5181E-24
47	2.3534E-24
48	7.3669E-25
49	2.3061E-25
50	7.2188E-26
51	2.2597E-26
52	7.0736E-27
53	2.2143E-27
54	6.9314E-28
55	2.1697E-28

LN DFR dm

Natural Log of Raw Data

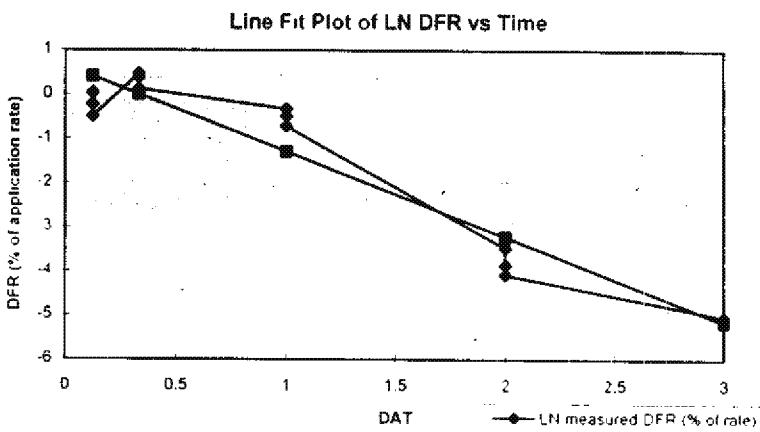
DAT	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv / A)	slope	intercept	R ²	Adjusted R ²	dissipation	Half-life days
0.125	0.3820384	-0.127417							
0.125	0.0971187	-0.127417							
0.125	-0.2585715	-0.127417							
0.333	1.0813903	-0.382027							
0.333	0.4286527	-0.382027							
0.333	0.0092292	-0.382027							
1	-0.4680296	-1.198492							
1	-0.4826998	-1.198492							
1	-1.6138556	-1.198492							
2	-3.549891	-2.422578							
2	-3.7227338	-2.422578							
2	-3.9241036	-2.422578							
3	-5.0074484	-3.646664							
3	-5.0074484	-3.646664							
3	-5.0074484	-3.646664							
4	-4.1472471	-4.87075							
4	-5.0074484	-4.87075							
4	-5.0074484	-4.87075							
5	-5.0074484	-6.094836							
5	-5.0074484	-6.094836							
5	-5.0074484	-6.094836							



(8) - MCPP dm

Natural Log of Raw Data

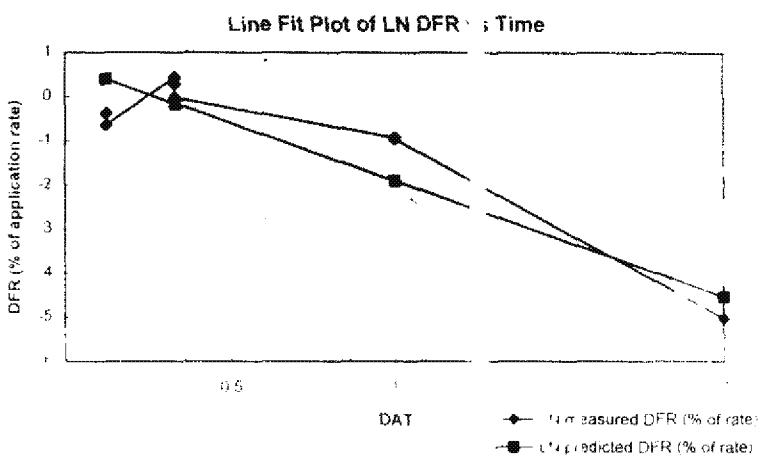
DAT	LN		Application rate (lb acid equiv./ A)	0.599
	measured DFR (% of rate)	predicted DFR (% of rate)		
0.125	0.0374203	0.408027	slope	-1.93349
0.125	-0.2252309	0.408027	intercept	0.64971
0.125	-0.4907719	0.408027	R^2	0.93002
0.333	0.4660488	0.00586	Adjusted R^2	0.92464
0.333	0.3863176	0.00586	dissipation	86%
0.333	0.1278929	0.00586	Half-life	0.36 days
1	-0.3252162	-1.28378		
1	-0.4810866	-1.28378		
1	-0.7133073	-1.28378		
2	-3.4648426	-3.217275		
2	-3.8631903	-3.217275		
2	-4.0845624	-3.217275		
3	-5.0277605	-5.150769		
3	-5.0277605	-5.150769		
3	-5.0277605	-5.150769		



DAT	incremental predicted DFR (% of rate)
0	1.91499233
1	0.27698817
2	0.0400641
3	0.00579495
4	0.00083819
5	0.00012124
6	1.7536E-05
7	2.5365E-06
8	3.6688E-07
9	5.3066E-08
10	7.6755E-09
11	1.1102E-09
12	1.6058E-10
13	2.3227E-11
14	3.3596E-12
15	4.8594E-13
16	7.0287E-14
17	1.0166E-14
18	1.4705E-15
19	2.1269E-16
20	3.0765E-17
21	4.4498E-18
22	6.4363E-19
23	9.3097E-20
24	1.3466E-20
25	1.9477E-21
26	2.8172E-22
27	4.0748E-23
28	5.8939E-24
29	8.5251E-25
30	1.2331E-25
31	1.7836E-26
32	2.5798E-27
33	3.7314E-28
34	5.3972E-29
35	7.8066E-30
36	1.1292E-30
37	1.6332E-31
38	2.3624E-32
39	3.417E-33
40	4.9424E-34
41	7.1487E-35
42	1.034E-35
43	1.4956E-36
44	2.1633E-37
45	3.129E-38
46	4.5258E-39
47	6.5463E-40
48	9.4687E-41
49	1.3696E-41
50	1.981E-42
51	2.8653E-43
52	4.1444E-44
53	5.9946E-45
54	8.6707E-46
55	1.2541E-46

Natural Log of Raw Data

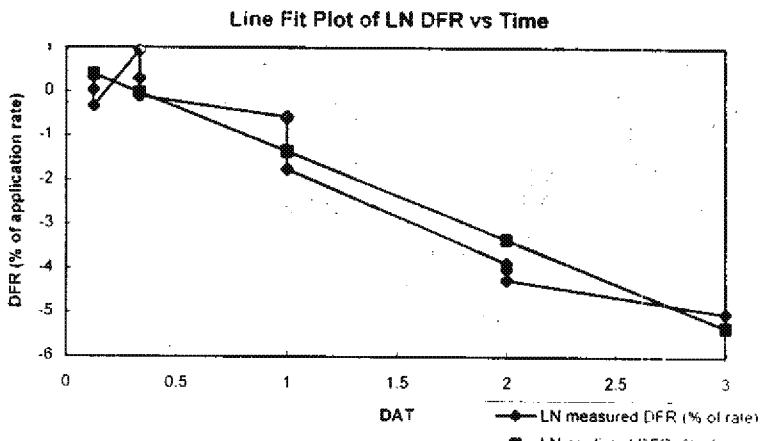
DAT	LN		Application rate (lb acid equiv / A)	0.594
	measured DFR (% of rate)	predicted DFR (% of rate)		
0.125	-0.3741201	0.391598	slope	-2.62287
0.125	-0.3741201	0.391598	intercept	0.71946
0.125	-0.6430562	0.391598	R^2	0.87467
0.333	0.4265686	-0.15396	Adjusted R^2	0.86214
0.333	0.2902321	-0.15396	dissipation	93%
0.333	-0.0301898	-0.15396	Half life	0.26 days
1	-0.9250402	-1.903416		
1	-0.9441613	-1.903416		
1	-0.9441613	-1.903416		
2	-5.0193848	-4.526289		
2	-5.0193848	-4.526289		
2	-5.0193848	-4.526289		



(10) - MCPP dma.com

Natural Log of Raw Data

DAT	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv./A)	incremental DFR (% of rate)
0.125	0.3285647	0.391343	slope -1.98962	0 1.89656587
0.125	0.0354151	0.391343	intercept 0.64004	1 0.25935107
0.125	-0.3355638	0.391343	R ² 0.93354	2 0.03546567
0.333	0.9280361	-0.022498	Adjusted R ² 0.92843	3 0.00484985
0.333	0.2953022	-0.022498	dissipation 86%	4 0.00066321
0.333	-0.1073484	-0.022498	Half-life 0.35 days	5 9.0692E-05
1	-0.5709644	-1.349573		6 1.2402E-05
1	-0.5926455	-1.349573		7 1.6959E-06
1	-1.7563444	-1.349573		8 2.3192E-07
2	-3.875147	-3.33919		9 3.1714E-08
2	-4.0076362	-3.33919		10 4.3368E-09
2	-4.2550297	-3.33919		11 5.9305E-10
3	-5.0109383	-5.328808		12 8.1098E-11
3	-5.0109383	-5.328808		13 1.109E-11
3	-5.0109383	-5.328808		14 1.5165E-12

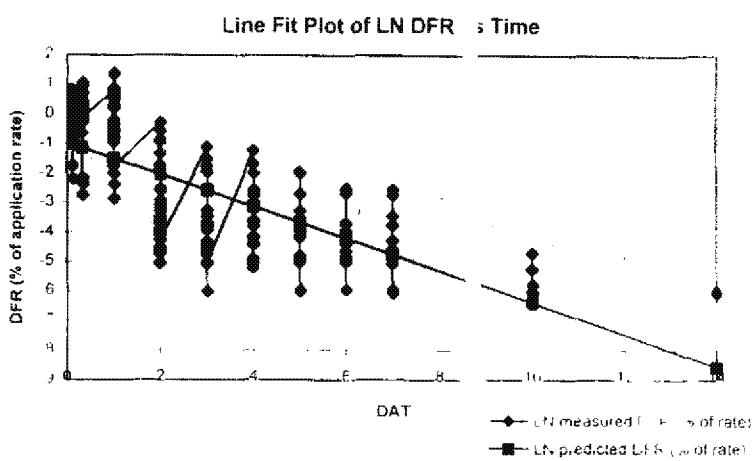


DAT	incremental DFR (% of rate)
0	1.89656587
1	0.25935107
2	0.03546567
3	0.00484985
4	0.00066321
5	9.0692E-05
6	1.2402E-05
7	1.6959E-06
8	2.3192E-07
9	3.1714E-08
10	4.3368E-09
11	5.9305E-10
12	8.1098E-11
13	1.109E-11
14	1.5165E-12
15	2.0738E-13
16	2.8359E-14
17	3.878E-15
18	5.3031E-16
19	7.2519E-17
20	9.9168E-18
21	1.3561E-18
22	1.8544E-19
23	2.5359E-20
24	3.4678E-21
25	4.7421E-22
26	6.4847E-23
27	8.8677E-24
28	1.2126E-24
29	1.6583E-25
30	2.2676E-26
31	3.1009E-27
32	4.2404E-28
33	5.7987E-29
34	7.9296E-30
35	1.0844E-30
36	1.4828E-31
37	2.0277E-32
38	2.7729E-33
39	3.7919E-34
40	5.1853E-35
41	7.0908E-36
42	9.6965E-37
43	1.326E-37
44	1.8132E-38
45	2.4796E-39
46	3.3907E-40
47	4.6368E-41
48	6.3407E-42
49	8.6707E-43
50	1.1857E-43
51	1.6214E-44
52	2.2172E-45
53	3.032E-46
54	4.1462E-47
55	5.6699E-48

at LOQ;

Natural Log of Raw Data

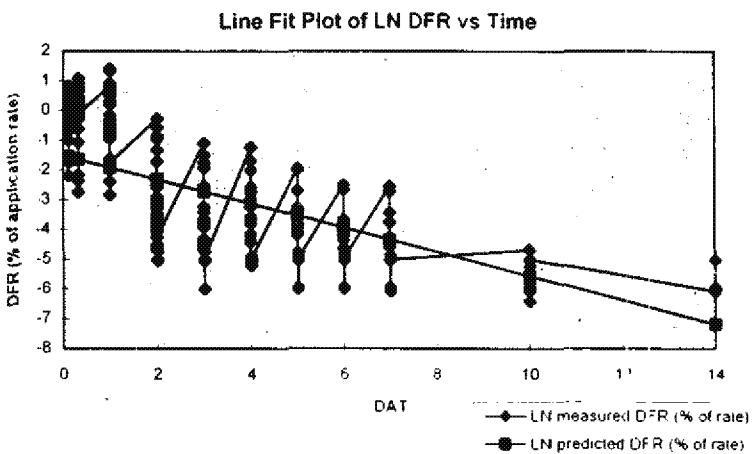
	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv/A)	N/A
DAT			slope	-0.54361
0.125	0.2591153	-1.008065	intercept	-0.94011
0.125	0.1432606	-1.008065	R ²	0.56918
0.125	0.1158288	-1.008065	Adjusted R ²	0.56809
0.125	0.8290678	-1.008065	dissipation	24
0.125	0.4558098	-1.008065	Half-life	1.1 days
0.125	-0.0883523	-1.008065		
0.125	-0.4176414	-1.008065		
0.125	-0.5069865	-1.008065		
0.125	-0.6945554	-1.008065		
0.125	0.6953156	-1.008065		
0.125	0.5987343	-1.008065		
0.125	0.3941482	-1.008065		
0.125	0.401227	-1.008065		
0.125	0.0755076	-1.008065		
0.125	-0.2503263	-1.008065		
0.125	0.1611463	-1.008065		
0.125	-0.1948037	-1.008065		
0.125	-0.4873284	-1.008065		
0.125	-0.9897847	-1.008065		
0.125	-1.7412976	-1.008065		
0.125	-2.1871587	-1.008065		
0.125	0.1890355	-1.008065		
0.125	-0.0014981	-1.008065		
0.125	-0.3473092	-1.008065		
0.125	0.3820384	-1.008065		
0.125	0.0971187	-1.008065		
0.125	-0.2585715	-1.008065		
0.125	0.0374203	-1.008065		
0.125	-0.2252309	-1.008065		
0.125	-0.4907719	-1.008065		
0.125	-0.3741201	-1.008065		
0.125	-0.3741201	-1.008065		
0.125	-0.6430562	-1.008065		
0.125	0.3285647	-1.008065		
0.125	0.0354151	-1.008065		
0.125	-0.3355638	-1.008065		
0.333	0.416289	-1.121137		
0.333	0.2222041	-1.121137		
0.333	0.1811045	-1.121137		
0.333	0.4292301	-1.121137		
0.333	-0.629773	-1.121137		
0.333	-1.0598094	-1.121137		
0.333	0.3049816	-1.121137		
0.333	0.1529035	-1.121137		
0.333	-0.1299593	-1.121137		
0.333	0.2580546	-1.121137		
0.333	0.2402343	-1.121137		
0.333	-0.0463912	-1.121137		
0.333	0.3291959	-1.121137		
0.333	0.3124591	-1.121137		
0.333	-0.093006	-1.121137		
0.333	0.7750965	-1.121137		
0.333	0.1036893	-1.121137		
0.333	-0.2937437	-1.121137		
0.333	-2.1548396	-1.121137		
0.333	-2.3521867	-1.121137		



all (LOQ extended to 14th day)

Natural Log of Raw Data

DAT	LN measured DFR (% of rate)	LN predicted DFR (% of rate)	Application rate (lb acid equiv./A)	N/A	DAT	incremental DFR (% of rate)
0.125	0.2591153	-1.551457	slope	-0.40621	0	0.22297836
0.125	0.1432606	-1.551457	intercept	-1.50068	1	0.14854159
0.125	0.1158288	-1.551457	R ²	0.53863	2	0.09895402
0.125	0.8290678	-1.551457	Adjusted R ²	0.53746	3	0.06592024
0.125	0.4558098	-1.551457	dissipation	33%	4	0.04391412
0.125	-0.0883523	-1.551457	Half-life	1.71 days	5	0.02925429
0.125	-0.4176414	-1.551457			6	0.01948834
0.125	-0.5069865	-1.551457			7	0.01298256
0.125	-0.6945554	-1.551457			8	0.0086486
0.125	0.6953156	-1.551457			9	0.00576144
0.125	0.5987343	-1.551457			10	0.0038381
0.125	0.3941482	-1.551457			11	0.00255683
0.125	0.401227	-1.551457			12	0.00170328
0.125	0.0755076	-1.551457			13	0.00113468
0.125	-0.2503263	-1.551457			14	0.00075589
0.125	0.16111463	-1.551457			15	0.00050355
0.125	-0.1948037	-1.551457			16	0.00033545
0.125	-0.4873284	-1.551457			17	0.00022347
0.125	-0.9897847	-1.551457			18	0.00014887
0.125	-1.7412976	-1.551457			19	9.9171E-05
0.125	-2.18711587	-1.551457			20	6.6065E-05
0.125	0.1890355	-1.551457			21	4.401E-05
0.125	-0.0014981	-1.551457			22	2.9318E-05
0.125	-0.3473092	-1.551457			23	1.9531E-05
0.125	0.3820384	-1.551457			24	1.3011E-05
0.125	0.09711187	-1.551457			25	8.6676E-06
0.125	-0.2585715	-1.551457			26	5.7741E-06
0.125	0.0374203	-1.551457			27	3.8465E-06
0.125	-0.2252309	-1.551457			28	2.5624E-06
0.125	-0.4907719	-1.551457			29	1.707E-06
0.125	-0.3741201	-1.551457			30	1.1372E-06
0.125	-0.3741201	-1.551457			31	7.5755E-07
0.125	-0.6430562	-1.551457			32	5.0465E-07
0.125	0.3285647	-1.551457			33	3.3619E-07
0.125	0.0354151	-1.551457			34	2.2396E-07
0.125	-0.3355638	-1.551457			35	1.4919E-07
0.333	0.416289	-1.635948			36	9.9388E-08
0.333	0.2222041	-1.635948			37	6.621E-08
0.333	0.1811045	-1.635948			38	4.4107E-08
0.333	0.4292301	-1.635948			39	2.9383E-08
0.333	-0.629773	-1.635948			40	1.9574E-08
0.333	-1.0598094	-1.635948			41	1.304E-08
0.333	0.3049816	-1.635948			42	8.6866E-09
0.333	0.1529035	-1.635948			43	5.7867E-09
0.333	-0.1299593	-1.635948			44	3.855E-09
0.333	0.2580546	-1.635948			45	2.5681E-09
0.333	0.2402343	-1.635948			46	1.7108E-09
0.333	-0.0463912	-1.635948			47	1.1397E-09
0.333	0.3291959	-1.635948			48	7.5921E-10
0.333	0.3124591	-1.635948			49	5.0576E-10
0.333	-0.093006	-1.635948			50	3.3692E-10
0.333	0.7750965	-1.635948			51	2.2445E-10
0.333	0.1036893	-1.635948			52	1.4952E-10
0.333	-0.2937437	-1.635948			53	9.9606E-11
0.333	-2.1548396	-1.635948			54	6.6355E-11
0.333	-2.3521867	-1.635948			55	4.4204E-11





13544

R108672

Chemical: 2-4,D; Propanoic acid, 2-(2,4-dichlorophenoxy)-; MCPA (and salts and esters); Mecoprop-P; Dicamba; 2,4-D, dimethylamine salt; Propanoic acid, 2-(2,4-dichlorophenoxy)-; MCPA, dimethylamine salt; Propanoic acid, 2-(4-chloro-2-methylphenyl); Benzoic acid, 3,6-dichloro-2-methoxy-, c; 2,4-D, 2-ethylhexyl ester; 2-Ethylhexyl (R)-2-(2,4-dichlorophenoxy); 2-Ethylhexyl (R)-2-(2-methyl-4-chlorophenyl)

PC Code: 030001; 031402; 030501; 129046; 029801; 030019; 031403; 030516; 031520; 029802; 030063; 031465; 031564

HED File Code 12000 Exposure Reviews

Memo Date: 01/06/99

File ID: DPD252025

Accession Number: 412-05-0095

HED Records Reference Center
06/03/2005